

REFERENCES

- Angalet, G. W. and L. W. Coles.** 1966. The establishment of *Aphidius smithi* in the eastern United States. *J. Econ. Ent.* 59: 769-770.
- Cooke, W. C.** 1963. Ecology of the pea aphid in the Blue Mountain area of eastern Washington and Oregon. *Tech. Bull. U. S. Dep. Agric.* 1287: 1-48.
- Hagen, K. S. and E. I. Schlinger.** 1960. Imported Indian parasite of pea aphid established in California. *Calif. Agric.* 12: 3, 15.
- Lindroth, C. H.** 1957. The faunal connections between Europe and North America. Wiley & Sons, New York.
- Lorković, Z.** 1953. Spezifische, semispezifische und rassische Differenzierung bei *Erebia tyndarus* Esp., I und II. *Rad. Acad. Yougosl.* 294: 269-309, 315-358.
- Mackauer, M.** 1962. *Monoctonus crepidis* (Haliday) (Hymenoptera: Aphidiidae) an aphid parasite new to North America. *Can. Ent.* 94: 1089-1093.
- and **H. E. Biddee.** 1965a. *Aphidius smithi* Sharma and Subba Rao (Hymenoptera: Aphidiidae) a parasite of the pea aphid new in southern Ontario. *Proc. Ent. Soc. Ont.* 95: 121-124.
- . 1965b. Two simple devices for rearing aphids. *J. Econ. Ent.* 58: 365-366.
- and **T. Finlayson.** 1967. The hymenopterous parasites (Hymenoptera: Aphidiidae et Aphelinidae) of the pea aphid in eastern North America. *Can. Ent.* 99: 1051-1082.
- Nicholls, C. F.** 1963. Some entomological equipment. *Inform. Bull. Res. Inst. Can. Dep. Agric., Belleville* 2: 1-85.

**THE GENERIC PLACEMENT OF TWO NEARCTIC HOLOPYGA
WITH BIOLOGICAL NOTES
(HYMENOPTERA: CHRYSIDIDAE)**

KARL V. KROMBEIN, *Smithsonian Institution, Washington, D. C. 20560*

ABSTRACT—Two new genera, *Muesebeckidium* and *Pseudolopyga*, are described to accommodate two Nearctic species, *obsoletum* (Say) and *taylori* (Bodenstein), formerly assigned to *Holopyga* Dahlbom. In addition, *Muesebeckidium occidentale*, n. sp., is described from Arizona, New Mexico, Sonora and Durango. *Hedychridium carrilloi* Bohart and Brumley is placed as a new synonym of *Pseudolopyga taylori*. Biological notes on the two new genera are included.

Four species of the cuckoo wasp genus *Holopyga* Dahlbom are listed by Bodenstein (1951) in his section of the catalog of Hymenoptera north of Mexico. These are *hora* Aaron, *obsoleta* (Say), *taylori* Bodenstein and *ventralis* (Say). Critical study of these four species demonstrates that *obsoleta* and *taylori* are not correctly assigned to *Holopyga*

and that each must be placed in a separate genus. Neither is referable to any of the other New World genera. Comparison of them with the generic diagnoses of Palaearctic Hedychrinae in Semenov's key (1954) shows clearly that they are not congeneric with any of the 19 taxa from that zoogeographic region. Edney (1940) includes no Ethiopian species which can be assigned to either of the genera represented by *obsoleta* and *taylori*. Finally, I have seen no specimens from the Oriental or Australian regions which can be so assigned.

Accordingly, we must assume that these genera are new and are most likely restricted to the Nearctic region. They may be distinguished at once from *Holopyga* by the fore femora which are more or less rounded in cross section instead of being strongly carinate along the ventral margin, and by the posterior angles of the propodeum which extend laterad instead of posteriorly. Notes on the biology of these two new genera are presented at the end of the taxonomic material.

I take this opportunity to dedicate one of the new genera to C. F. W. Muesebeck in celebration of his 75th birthday. During his many years at the U.S. National Museum, formerly as the head of systematic entomology investigations for the U.S. Department of Agriculture, and presently as an honored Research Associate of the Smithsonian Institution, I have come to know and to cherish Carl Muesebeck very highly. His quietly skillful and dynamic leadership of the Insect Identification Division, USDA, brought it to a peak in professional and support strength not equaled before or since. Had it not been for his effective and tactful direction, an epochal contribution such as the catalog of North American Hymenoptera might not be a reality today. Finally, his warm personal interest in the professional development and well-being of his staff endeared him to all of those privileged to work under his leadership.

Muesebeckidium,¹ n. gen.

(Figs. 1, 2, 8-13)

Type of the genus: *Hedychrum obsoletum* Say, 1836 (= *Hedychrum zimmermanni* Dahlbom, 1845, syn. by Norton, 1879).

Muesebeckidium is readily distinguished from all other genera of Chrysididae by a combination of the dentition of the tarsal claws (figs. 10, 11), the relatively broadened fore (fig. 8) and mid tarsi of the female, the ecarinate fore femur, the carinate sides of the pronotal disk, the sparsely and delicately punctate vertex, pronotal disk and scutum (fig. 1), and the forwardly thrust lower angle of the mesopleuron (fig. 2).

¹The name is formed with the suffix *-idium*, little. Similarly formed generic names are common in the Hedychrinae, e.g., *Hedychridium* Abeille, *Hexachridium* Bischoff, *Cyrtuchridium* Semenov, *Euchridium* Semenov and *Zarudnidium* Semenov.

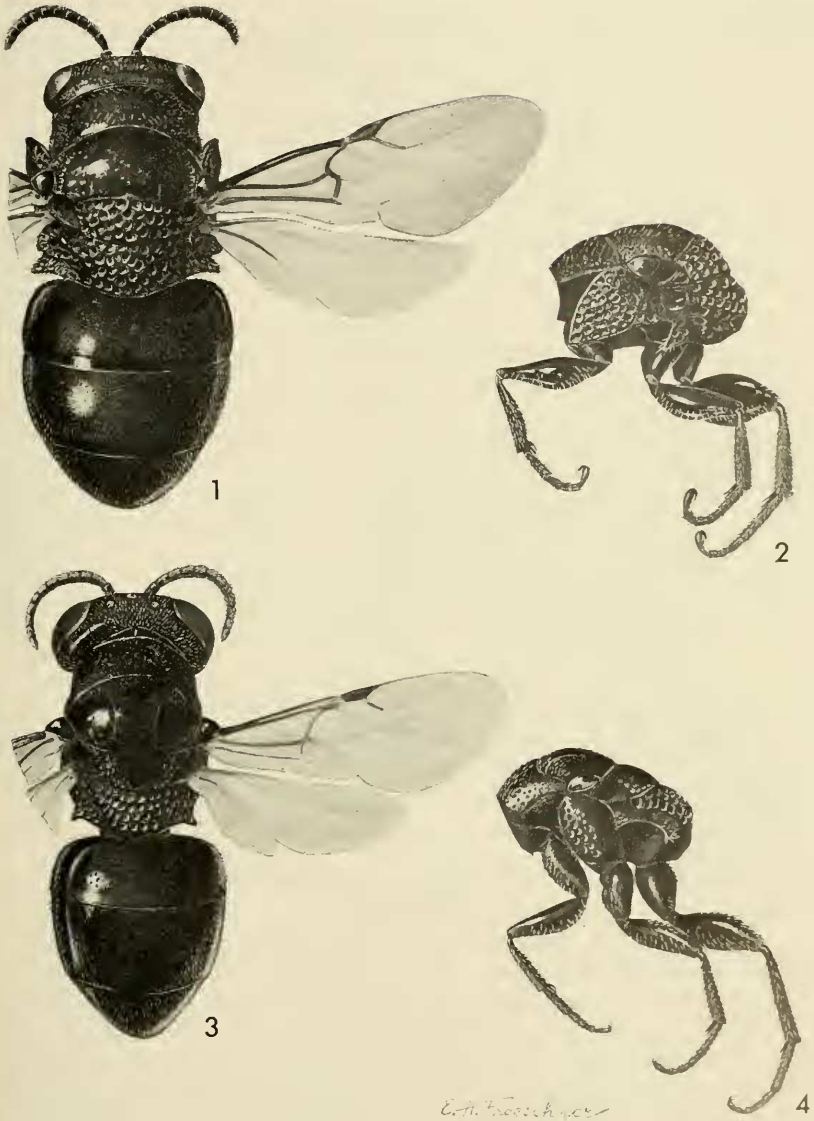


Plate I

Figs. 1, 2. *Muesebeckidium obsoletum* (Say), dorsal aspect of whole insect (1) and lateral aspect of thorax (2). Figs. 3, 4. *Pseudolopyga taylori* (Bodenstein), dorsal aspect of whole insect (3) and lateral aspect of thorax (4).

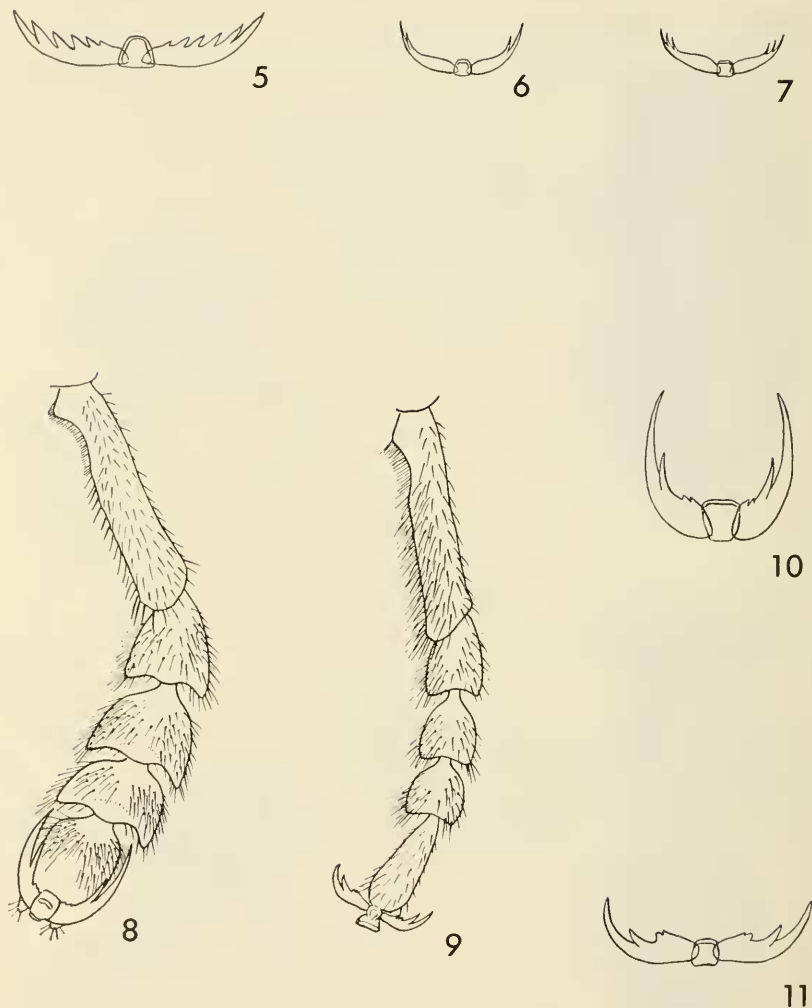


Plate II

Fig. 5. *Holopyga ventralis* (Say), fore tarsal claws, male. Figs. 6, 7. *Pseudolopyga taylori* (Bodenstein), fore tarsal claws, female (6) and male (7). Figs. 8, 9. *Muesebeckidium obsoletum* (Say), ventral view fore tarsi, female (8) and male (9). Figs. 10, 11. *M. obsoletum*, fore tarsal claws, female (10) and male (11). (Illustrations by Elsie H. Froeschner.)

Moderately stout Hedychrinae (figs. 1, 2) having the aspect of *Omalus* Panzer, 4–5 mm long; sexual dimorphism very marked in fore and mid tarsi (figs. 8, 9).

Proboscis short, retracted at rest; mandible stout, with a tooth on inner margin near apex; malar space extremely short, as in *Holopyga*; apical margin of clypeus

straight, not thickened as in *Holopyga*; frontal concavity delicately, closely and arcuately carinate, not margined above; ocelli in a low triangle, lateral ocellar distance subequal to diameter of lateral ocellus; vertex with a strong groove behind posterior ocelli and very sparsely and weakly punctate except at sides.

Thorax in profile not so strongly rounded as in *Holopyga*; pronotal disk and scutum very sparsely and delicately punctate; pronotal disk margined anteriorly by a weak carina, laterally by a strong carina; scutum about 1.3 times as long as pronotal disk; mesopleuron with sides strongly margined, strongly thrust forward below so that seen from above its lower angles extend nearly as far forward as anterolateral angles of pronotal disk; scutellum, postscutellum and mesopleural disk coarsely and closely pitted; upper angles of propodeum large and stout, extending laterad.

Radial vein very short, extending only slightly beyond end of costa; basal vein strongly arcuate; discoidal cell vaguely defined by darkening of wing membrane, its apex extending as far distad as radial vein; median and submedian cells completely devoid of setae.

Fore femur rounded in cross section, not greatly expanded at base; all tibiae with a pair of carinae margining outer surface; hind tibia ecarinate on inner surface; fore tarsus of female without comb; fore (fig. 8) and mid tarsi of female broadened, beneath slightly concave and clothed with short, dense, stiff setae, the terminal segments curled inward; tarsal claw split, inner ray not as long as outer and basal portion of claw with two short blunt teeth (figs. 10, 11); fore and mid tarsal claws of female as long as distitarsi and appressed closely against them in most museum specimens, hind tarsal claws of female and of all tarsi in male smaller, not so appressed.

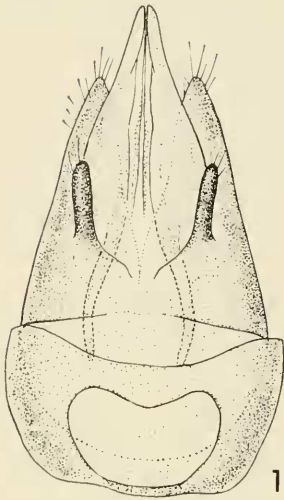
Dorsum of abdomen with small, scattered punctures on first two terga, closer on third; posterior margins of first two terga narrowly impunctate and thin; second tergum without a longitudinal carina; apical margin of third tergum evenly rounded, slightly reflexed; male genitalia (figs. 12, 13) with aedeagus and parameres much stouter than in *Holopyga* (fig. 15) and cuspis volsellaris much shorter, digitus volsellaris lacking.

Muesebeckidium obsoletum (Say)

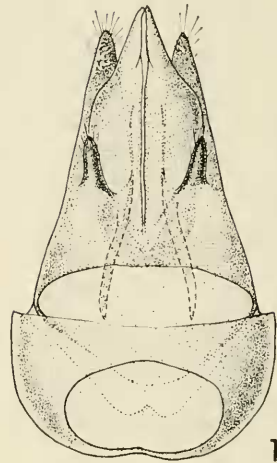
(Figs. 1, 2, 8-12)

Say (1836) described *obsoletum* from Indiana and gave the sex as female. He may have had a male, however, inasmuch as he did not mention that the tarsi were flattened and expanded. Dahlbom (1845) described the same species as *Hedychrum zimmermanni* from New Jersey. He did not mention the sex, but presumably he had a female because he stated that the tarsi were slightly dilated.

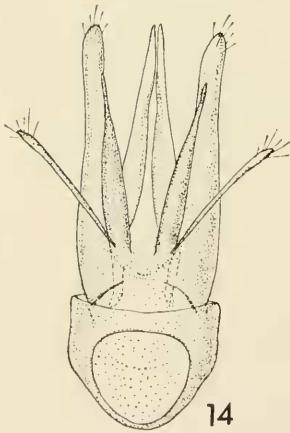
M. obsoletum is apparently widely distributed in North America in the Upper and Lower Austral Zones east of the 100th meridian. The species is known to occur in Ontario, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, Georgia, Florida, Tennessee, Ohio, Michigan, Indiana, Illinois, Minnesota, Iowa, Kansas and Nebraska. These specimens are uniform in details of the punctation and sculpture. I have also seen an *obsoletum*



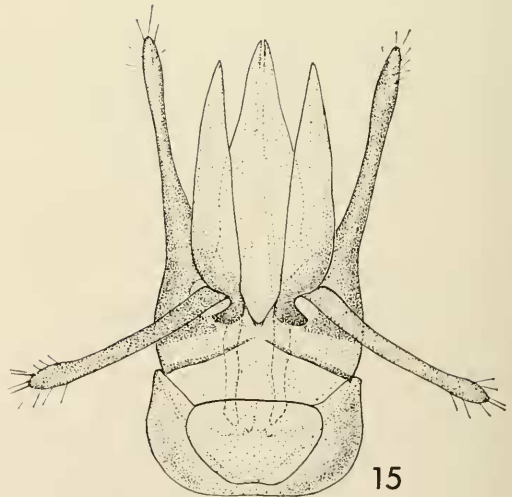
12



13



14



15

Plate III

Male genitalia, ventral aspect. Fig. 12. *Muesebeckidium obsoletum* (Say). Fig. 13. *M. occidentale*, n. sp. Fig. 14. *Pseudolopyga taylori* (Bodenstein). Fig. 15. *Holopyga ventralis* (Say). (Illustrations by Elsie H. Froeschner.)

male in the Cornell University collection labeled as having been taken at Buenavista, near Santa Cruz, Bolivia, by J. Steinbach in 1928; I suspect that it is mislabeled.

Muesebeckidium occidentale, n. sp.

(Fig. 13)

This distinctive species, known from a short series from the Lower Sonoran Zone of western North America, is readily distinguished from its eastern congener *obsoletum* by usually having the integument lighter blue with some greenish reflections rather than darker blue with a purplish cast, by the coarser, deeper, closer punctation of the abdominal terga, and by the shorter cuspis volsellaris and more slender paramere of the male genitalia.

Male. Length 4–5 mm. Integument lighter blue than in *obsoletum*, thorax with some green reflections especially on mesopleuron. Sculpture of head and thorax as in *obsoletum*. Punctures of abdominal terga relatively coarser, deeper and closer than in *obsoletum*, most of those on second and third terga separated from each other by less than the diameter of a puncture. Genitalia (fig. 13) with cuspis volsellaris shorter and stouter than in *obsoletum*, and the paramere more slender.

Female. Length 4.5–5.5 mm. Similar to male, the head and abdomen occasionally with green reflections also. Fore and mid tarsi wider than in male as is normal for genus. Punctures of abdominal terga more numerous than in male especially on second and third terga where they tend to be subcontiguous; apex of third tergum more narrowly rounded than in *obsoletum*.

Holotype. ♂, Queen Creek, Arizona, July 13, 1956, C. Williams, swept from cotton (USNM Type No. 70718).

Allotype. ♀, Toltec, Arizona, July 19, 1956, C. Williams, swept from alfalfa (USNM).

Paratypes. 1 ♂, same data as type. 1 ♀, 14 miles south of Mesilla Park, Dona Ana Co., New Mexico, September 23, 1965, G. E. Bohart, on *Cleomella*. 1 ♀, Ferguson Ranch, Alamos, Sonora, September 19, 1957, P. H. Timberlake. 1 ♂, Nombre de Dios, Durango, August 1, 1951, P. D. Hurd. Paratypes are in the University of California at Davis, and the California Insect Survey. I am greatly indebted to Dr. Richard M. Bohart for allowing me to place the holotype in the National Museum collection.

Pseudolopyga, n. gen.

(Figs. 3, 4, 6, 7, 14)

Type of the genus: *Holopyga taylori* Bodenstein 1939 (= *Hedychridium carrilloi* Bohart and Brumley, 1967, new synonymy).

Pseudolopyga may be distinguished from other genera of hedychrine Chrysididae by a combination of the ecarinate fore femur, the straight basal vein in the forewing, and the lack of a transverse groove on the

vertex behind the posterior ocelli. The genus is also peculiar in that the female tarsal claws (fig. 6) are spilt with a single tooth near the middle somewhat as in *Hedychridium*, whereas the male tarsal claws (fig. 7) have two small pectinate teeth next to the apical tooth, a condition similar to that of *Holopyga*.

Relatively slender, tiny *Hedychrinae*, 2–3.5 mm long (figs. 3, 4).

Proboscis short, retracted at rest; mandible stout, with two teeth on inner margin near apex as in *Holopyga*; malar space about as long as width of antennal flagellum; apical margin of clypeus thin, subtruncate or with a narrow rounded emargination in middle, frontal concavity almost smooth or with close, delicate arcuate carinae, not margined above; ocelli in a low triangle, lateral ocellar distance twice the diameter of lateral ocellus; vertex not grooved behind posterior ocelli; top of head with small, moderately separated punctures.

Thorax in profile moderately rounded, dorsum with shallow, small, moderately close punctures rather uniform in size; pronotal margins ecarinate; exposed part of scutum about as long as pronotal disk, the normally concealed anterior part with dense small punctures; mesopleural disk not strongly thrust forward below, not margined, the surface with large shallow pits; upper angles of propodeum small and stout, extending laterad.

Radial vein very short, extending slightly beyond end of stigma; basal vein almost straight; discoidal cell not defined; median and submedian cells with a few scattered setae.

Fore femur rounded in cross section, not greatly expanded at base; tibiae ecarinate on both outer and inner surfaces; fore tarsus of female without comb; tarsal claw of male (fig. 7) with two small teeth within, the latter not subbasal but nearer the tip, that of female (fig. 6) with a single tooth near middle.

Dorsum of abdomen with small, relatively close punctures, the posterior margins of first two terga thin and narrowly impunctate; second tergum without a longitudinal carina; apical margin of third tergum slightly reflexed laterally, at apex subtruncate or rounded; male genitalia (fig. 14) with cuspis volsellaris somewhat shorter and more slender than in *Holopyga* (fig. 15); digitus volsellaris more slender and directed posterolaterad rather than anterolaterad.

The only described species belonging to *Pseudolopyga* is *taylori* (= *Hedychridium carrilloi* Bohart and Brumley²). There are, however, several undescribed species in the western United States.

P. taylori is known from California, Nevada, Arizona, New Mexico, Idaho and Missouri. However, the paratype of *taylori* from San Diego Co., California, is not congeneric.

BIOLOGY

No information has been published on the biology of *Muesebeckidium obsoletum* (Say). Labels on some specimens before me indicate that females frequent flowers, presumably for nectar. Flower visiting

² *Hedychridium solierellae* Bohart and Brumley, 1967, is correctly assigned to *Hedychridium*.

records include *Anethum*, *Arenaria stricta*, *Ceanothus americanus*, *Lotus corniculatus*, *Pastinaca sativa* and *Rhus copallina*. K. W. Cooper advises me that in his experience *obsoletum* is quite rare. He has captured at least 7 females and 2 males, all in woods-margined swamps and all on flowers of water hemlock, *Cicuta*. Dates of capture (June–August) in New York, New Jersey and Virginia establish that there are at least two generations a year.

Flower visiting records for *occidentale* include alfalfa, cotton and *Cleomella*.

The unique, relatively broadened fore and mid tarsi of *Muesebeckidium* females are slightly concave beneath and furnished ventrally with dense, stiff hair. These tarsal modifications and the lack of a tarsal comb suggest that the probable host may be some sphecid wasp, such as various species of Crabroninae or Pemphredoninae which nest in twigs and make partitions between the cells and the closing plug of the nest from small, rather loosely packed particles of pith. These tarsal modifications would be admirably suited for penetration of such easily dislodged material, thus giving the chrysidid access to the host cells for oviposition therein.

Pseudolopyga taylori (Bodenstein) has been reared from two sphecid wasps belonging to the genus *Solierella* of the Miscophini, *peckhami* (Ashmead) and *affinis blaisdelli* (Bridwell). Rau (1928, pp. 375–377), in his account of the biology of *peckhami* (misidentified as *Silaon niger* Rohwer), records, among others,³ *Ellampus* sp. as a parasite. Several specimens of *S. peckhami* in the U.S. National Museum bear Rau numbers 3816 and 3817, and three paratypes of *P. taylori* bear numbers 3812 and 3813. Reference to the Rohwer-Rau correspondence file shows that these specimens were reported upon by Rohwer in 1921, as *Silaon niger* and *Ellampus* sp. These data show beyond doubt that Rau did rear *taylori* from nests of *peckhami* at St. Louis, Missouri. Bohart and Brumley (1967) reported both of these *Solierella* as hosts of *taylori* (recorded as *carrilloi*, a synonym). The other host record for *taylori* was from a nest of *affinis blaisdelli* at Portal, Arizona, by Krombein (1967, pp. 177–178 and 443).

It should be noted that one paratype of *P. taylori*, bearing number 3813, is pinned with a puparium of a miltogrammine fly, possibly *Senotainia* (det. C. W. Sabrosky). The puparium contains a mummified fly, so the chrysidid obviously did not develop in the puparium. *Senotainia* parasitizes ground-nesting wasps, so it is most likely that

³ The other parasites recorded by Rau were identified by Rohwer as *Cleptes* sp. and *Chrysis* sp. I have been unable to trace down the *Chrysis*; its relationship to *Solierella peckhami*, if it is in the proper genus, is very dubious. The *Cleptes* was reported to Rau under his numbers 3812 and 3815. Specimen #3812 was returned to Rau; #3815 is actually a badly broken specimen of *Hedychridium coeruleum* (Norton).

the host wasp placed the puparium in her nest together with the other ground debris brought in and interspersed among the prey stored for her progeny.

The two host species of *Solierella* nest in abandoned borings of other insects in twigs, in hollow stems, or in wooden traps containing a boring of small diameter (3.2 mm). Both host species prey on immature lygaeid bugs belonging to the genus *Nysius*.

Normally, a chrysidid visits the host nest during its construction and lays one or more eggs per cell. When the chrysidid larva hatches, it kills either the host egg or young larva and then develops on the prey stored for the host larva; or, it attaches to the host larva and devours it only after the latter has completed feeding, spun a cocoon and become a resting larva. In a third type of parasitism, some chrysidid females breach the host cocoon and deposit an egg on the diapausing host larva.

However, Carrillo (1967) reported a most unusual type of chrysidid parasitism for *taylori* (as *Hedychridium* sp. "A"). He determined that the females of *taylori* oviposit in the first or second instar nymphs of *Nysius*. The *taylori* larva hatches in ten days, but no further development occurs unless the parasitized nymph is then stung by a *Solierella* female and carried to her nest. The act of stinging, probably due to the effects of the venom, initiates molting of the chrysidid larva. This second instar *taylori* larva then emerges from the *Nysius*, seeks out the *Solierella* egg or larva and kills it. The *taylori* larva then develops on the other *Nysius* nymphs stored in the cell. Carrillo found five larval instars in *taylori*. He also determined that only one *taylori* developed per *Solierella* cell, any other *taylori* larvae being killed by the first larva to emerge.

After completion of feeding the *taylori* larva spins a small, almost spherical cocoon about 3 mm in diameter. Krombein noted that the outer surface of the cocoon was composed of short fibers of white silk, that the inner surface was honey-colored and varnished, and that there was a small pore at the anterior end covered on the inner surface with varnished silk; Rau's cocoons, several of which are in the U.S. National Museum, are quite similar.

Krombein's single specimen of *taylori* overwintered, presumably as a diapausing larva; Rau gave no details of the biology of his *taylori*. It seems probable that there are two or more generations annually of the *Pseudolopyga*.

Some paratypes of both sexes of *taylori* from Idaho bear labels indicating that they were taken on *Atriplex rosea*, *Norta altissima*, *Salsola filipes*, *S. parviflora*, *S. pestifera* and *Sophia sophia*. Bohart and Brumley (1967) reported that both sexes of *taylori* (recorded as *carrilloi*, a synonym) were collected on *Portulaca*. Presumably, these

plants were visited either to obtain *Nysius* nymphs or to obtain nectar from the flowers, or, possibly, for both purposes.

REFERENCES

- Bodenstein, W. G.** 1939. A new *Holopyga* from the western United States. Ent. News 50: 19-21.
- . 1951. in Muesebeck, C. F. W., K. V. Krombein and H. K. Townes. Hymenoptera of America north of Mexico—Synoptic Catalog. U. S. Dept. Agr., Agr. Monogr. 2, p. 720.
- Bohart, R. M. and R. L. Brumley.** 1967. Two new species of *Hedychridium* from California. Pan-Pacific Ent. 43: 232-235, 8 figs.
- Carrillo S., J. L.** 1967. Ecological relationships between *Solierella peckhami* (Ashmead), *S. blaisdelli* (Bridwell), and two species of *Hedychridium*. Dissertation Abstr., Sci. and Engr. 28B(1): 220-B.
- Dahlbom, A. G.** 1845. Dispositio methodica specierum Hymenopterorum secundum familias Insectorum naturales. Part II, *Chrysis* in sensu Linnaeano, p. 2.
- Edney, E. B.** 1940. The Heteronychinae of South Africa. Occas. Papers Nat. Mus. S. Rhodesia, no. 9, pp. 29-125, 67 text figs.
- Krombein, K. V.** 1967. Trap-nesting wasps and bees: Life histories, nests and associates. Smithsonian Press, vi + 570 pp., frontispiece, 2 text figs., 36 tables, 29 pls.
- Norton, E.** 1879. On the Chrysidids of North America. Trans. Amer. Ent. Soc. 7: 237.
- Ran, P.** 1928. Field studies in the behavior of the non-social wasps. Trans. Acad. Sci. St. Louis 25: 325-489, 11 pls.
- Say, T.** 1836. Descriptions of new species of North American Hymenoptera and observations on some already described. Boston Jour. Nat. Hist. 1: 284-285.
- Semenov-Tyan-Shanskii, A. P.** 1954. Classification of the tribe Hedychrini Moes. and description of new species. Transl. from Russian (Trudy Zool. Inst. Akad. Nauk SSSR 15: 138-145) by Office Tech. Serv., U. S. Dept. Commerce, 9 pp., 1964.

DIE NEARKTISCHEN ASPILOTA-ARTEN DER SEKTION B
(HYMENOPTERA: BRACONIDAE)

MAX FISCHER, *Naturhistorisches Museum, Vienna, Austria*

ABSTRACT—The *Aspilota* Foerster complex is divided into four sections. The Nearctic species of section B are revised. A key is given for the identification of the following three species: *A. compressigaster*, n. sp., *A. insularis*, n. sp., and *A. miraculosa*, n. sp. The new species are described in full.

Aspilota ist zweifellos eine der schwierigsten Braconiden-Gattungen. Die Tiere sind sehr klein und weisen zahlreiche, jedoch leider nur allzu oft schwer erfassbare und schwierig auswertbare morphologische